he ſaid, hung the bell: This is a piece of ſtone iſſuing out of the roof, which when ſtruck ſounds like a bell.

"Some of the ſtalactites are of a colour like ſugar-candy, and others reſemble loaf-ſugar; but it is a pity that their beauty is now almoſt deſtroyed by the country people. The water, as it falls, runs down the declivity; and it is both wholeſome and pleaſant to drink, when it has diſcharged its petrifying matter. It is remarkable that we found ſeveral holes at the bottom of the cave, going down perpendicularly, perhaps into the abyſs, which renders it dangerous to be without a light. At the end of the cave, there is a pretty run, which takes its courſe through part of it, and then loſes itſelf among the rocks: Here is alſo its exit, by an aperture which is very narrow. Through this the vapours continually paſs outwards, with a ſtrong current of air; and, at night, theſe vapours aſcending reſemble a great furnace. Part of theſe vapours and fogs appear, on aſcending, to be condenſed at the head of this great alembic, and the more volatile parts to be carried off, through the aperture communicating with the exterior air before mentioned, by the force of the air in its paſſage.

"I beg pardon for having troubled you with ſuch a long detail. It appears ſtrange to me that none of our philoſophers have hitherto publiſhed a true account of this remarkable grotto."

N° XVI.

An Account of ſome Experiments on Magnetiſm, in a Letter to JOHN PAGE, *Eſquire, at Williamsburg.*

DEAR SIR,

Read Feb. 6, 1781. AGREEABLE to the promiſe in my laſt, I ſhall now communicate to you ſome conjectures and experiments on magnetiſm, which may perhaps either

either afford you ſome amuſement, or induce you to purſue the ſubject to more certainty.

I ſuppoſe then, that magnetical particles of matter are a neceſſary conſtituent part of that metal which we call iron, though they are probably but a ſmall proportion of the whole maſs. Theſe magnetical particles I ſuppoſe have each a north and a ſouth pole, and that they retain their polarity, however the metal may be fuſed or otherwiſe wrought. In a piece of iron which ſhews no ſigns of magnetiſm theſe magnetical particles lie irregularly, with their poles pointing in all poſſible directions, they therefore mutually deſtroy each other's effects. By giving magnetiſm to a piece of iron we do nothing more than arrange theſe particles, and when this is done it depends on the temper and ſituation of the iron whether that arrangement ſhall continue, that is, whether the piece of metal ſhall remain for a long time magnetical or not.

There is ſome power, whenceſoever derived, diffuſed through every part of ſpace which we have acceſs to, which acts on theſe magnetical particles, impelling one of their poles in a certain direction with reſpect to the earth and the other pole in the oppoſite direction. The direction in which this power acts I take to be the ſame with that of the dipping needle.

By applying a magnet to a piece of iron it becomes magnetical; for the magnet acting ſtrongly on the above mentioned particles, that action arranges them properly; overcoming the reſiſtance of the ſurrounding parts of the iron, and this reſiſtance afterwards ſerves to ſecure them in their proper ſituations, and prevents their being deranged by any little accident.

If we place a piece of iron in or near the direction of the dipping needle, it will in time become magnetical; that general power producing in this caſe the ſame effect as the application of the magnet, though in a weaker degree.

Iron

Iron or ſoft ſteel receives magnetiſm more eaſily than hardened ſteel, but will not retain it; may not this be, becauſe the magnetical particles are not ſo cloſely confined in ſoft as in hardened ſteel, and on that account more caſily admit of arrangement or derangement. By making a piece of ſteel red hot, or by twiſting it or beating it with a hammer, we may effectually deſtroy its magnetiſm. Now all theſe operations certainly derange the particles which compoſe the bar. By rubbing one piece of ſteel with another, magnetiſm may be produced, and it is eaſy to conceive how this operation, by the tremulous motion which it excites, may contribute to arrange the magnetical particles.

We took a ſoft ſteel ramrod, which did not diſcover the leaſt ſign of magnetiſm, and holding it in the direction of the dipping needle, ſtruck it ſeveral ſmart blows with a hammer, on one end; then laying it on a watch chryſtal it traverſed very well; that end which was held downwards, when ſtruck, becoming a north pole, whether the ſtroke was applied to the upper or the lower end. By turning the ſouth end downwards and ſtriking it afreſh, the magnetiſm was deſtroyed or reverſed, and it was curious to obſerve how very nicely you muſt adjuſt the number and force of the ſtrokes, preciſely to deſtroy the magnetiſm before communicated, without giving it anew, in a contrary direction. When we held the ramrod directly acroſs the line of the dipping needle, whilſt it was ſtruck with a hammer, on many trials it did not diſcover any ſigns of magnetiſm. But when held in any other direction, that end which approached neareſt to the point which the lower end of the dipping needle tends to, always became the north pole. From all this does it not ſeem very probable that during the concuſſion of the ſtroke, and whilſt the magnetical particles of the rod were moſt diſengaged from the ſurrounding matter, the active power abovementioned ſeized them and arranged them properly, where being confined,

confined, the rod afterwards remained magnetical. All this is nevertheleſs little more than conjecture, until confirmed by further experiments.

I am, dear ſir, yours, &c.

DAVID RITTENHOUSE.

N° XVII.

New Method of placing a Meridian Mark, in a Letter to the Rev. Dr. EWING, *Provoſt of the Univerſity. By* D. RITTENHOUSE, *Eſquire.*

DEAR SIR,

Read Nov. 1785. SOME time ago I mentioned to you a new invention I had for fixing a Meridian Mark for my Obſervatory. This I have ſince executed, and as it anſwers perfectly well, I ſhall give you a particular deſcription of it.

When my obſervatory was firſt erected, I placed a meridian mark to the northward at the diſtance of about 1200 feet, my view to the ſouth being too much confined by adjacent buildings, and that to the north was not diſtant enough to have the mark free from a ſenſible parallax. But laſt ſummer a new brick houſe was built directly north of the obſervatory, and much too nigh for diſtant viſion with the tranſit inſtrument. Now though a fixed mark is not abſolutely neceſſary where you have a good tranſit inſtrument, the poſition of which may be examined and accurately corrected, if neceſſary, every fair day, by the paſſage of the pole-ſtar above and below the pole, it is nevertheleſs very convenient, ſaves much trouble, and may ſometimes prevent miſtakes. We have an inſtance in the obſervations of the Aſtronomer Royal at Greenwich. His